

# 12-1 What are the properties of matter?

**Objective** ▶ Identify four basic properties of matter.

## TechTerms

- ▶ **chemistry** (KEM-is-tree): study of matter and its reactions
- ▶ **matter**: anything that has mass and takes up space
- ▶ **properties** (PROP-ur-tees): characteristics used to describe a substance

**Matter** Look around you. What do all the objects you see around you have in common? They are all made up of **matter**. Matter is anything that has mass and takes up space. Mass is the amount of matter an object contains. The amount of space an object takes up is its volume.

Water is matter. A glass filled with water is heavier than an empty glass. A filled glass is heavier because water has mass. If you kept adding water to a filled glass, the water would overflow. It would overflow because water takes up space.



Air is matter, too. A balloon filled with air is heavier than a balloon that is not blown up because air has mass. When you blow air into a balloon, the balloon gets larger as air takes up space.

► **Define:** What is matter?

**Properties of Matter** How would you describe an apple? You might say that an apple is red, round, and hard. Color, shape, and hardness are three **properties** (PROP-ur-tees) of matter. Properties are characteristics used to describe an object. Mass and volume are two basic properties of matter. Weight and density also are basic properties of matter. Weight is a measure of the pull of gravity on an object. Density tells you how much matter is in a certain volume.

► **List:** What are the four basic properties of matter?

**Studying Matter** The study of matter and the reactions of matter is called **chemistry** (CHEM-is-tree). Scientists who study matter are called chemists. Chemists study what different substances are made of. They do experiments to learn how different kinds of matter can change and combine.



► **Define:** What is chemistry?

## LESSON SUMMARY

- ▶ Matter is anything that has mass and takes up space.
- ▶ Water is matter.
- ▶ Air has mass and takes up space.
- ▶ Properties are characteristics used to describe an object.
- ▶ Mass, volume, weight, and density are the four basic properties of matter.
- ▶ Chemistry is the study of matter and the reactions of matter.

**CHECK** Complete the following.

1. All the objects you see around you are made up of \_\_\_\_\_.
2. Matter is anything that has mass and takes up \_\_\_\_\_.
3. Mass is a basic \_\_\_\_\_ of matter.
4. Weight is a measure of the pull of \_\_\_\_\_ on an object.
5. The amount of space taken up by matter is its \_\_\_\_\_.
6. The amount of matter per unit volume is called \_\_\_\_\_.

**APPLY** Complete the following.

7. **Compare:** What is the difference between mass and weight?
8. **Explain:** Why do you think scientists can use the basic properties of matter to help identify an unknown substance?

## Skill Builder

**Calculating** You can find the density of an object by dividing its mass by its volume. Mass is measured in grams. Volume is measured in milliliters or cubic centimeters. The units for density are g/mL or g/cm<sup>3</sup>. Find the density of each of the following objects: a wooden block with a volume of 1 cm<sup>3</sup> and a mass of 0.8 g; a 10-cm<sup>3</sup> piece of lead that has a mass of 113 g; an ice cube that has a volume of 2 cm<sup>3</sup> and a mass of 1.8 g. Organize your data in a table.

## Ideas in Action

**IDEA:** Some properties can be observed using your five senses.

**ACTION:** Choose three common objects. Describe 10 properties of each object you choose. Which of your senses helped you describe the objects?

## ACTIVITY

### OBSERVING THAT AIR IS MATTER

You will need a glass, a marking pen, a tissue, a pail, and water.

1. Stuff a tissue into the bottom of a glass. Fill a pail with water.
2. Turn the glass upside down and push it straight down into the pail of water.
3. Pull the glass straight out of the water and feel the tissue. Record your observations.

### Questions

1. **Observe:** Did the tissue feel wet?
2. **Why** did water not enter the glass?
3. **Relate:** How does this activity show that air is matter?

